
UREx
SRN

Urban Resilience to Extremes Sustainability Research Network

NIST Community Resilience Panel
4 April 2016
Portland, OR

Thaddeus Miller, PhD
Assistant Professor
Toulan School of Urban Studies and Planning
Portland State University
Thaddeus.Miller@pdx.edu

Climate change is widely considered one of the greatest challenges to global sustainability.

Extreme events are the most immediate way that people experience climate change and urban areas are particularly vulnerable to such events, given their location, concentration of people, and increasingly complex and interdependent infrastructures.

Urbanization and climate change are on a collision course and infrastructure is their battlefield

COASTAL FLOODING

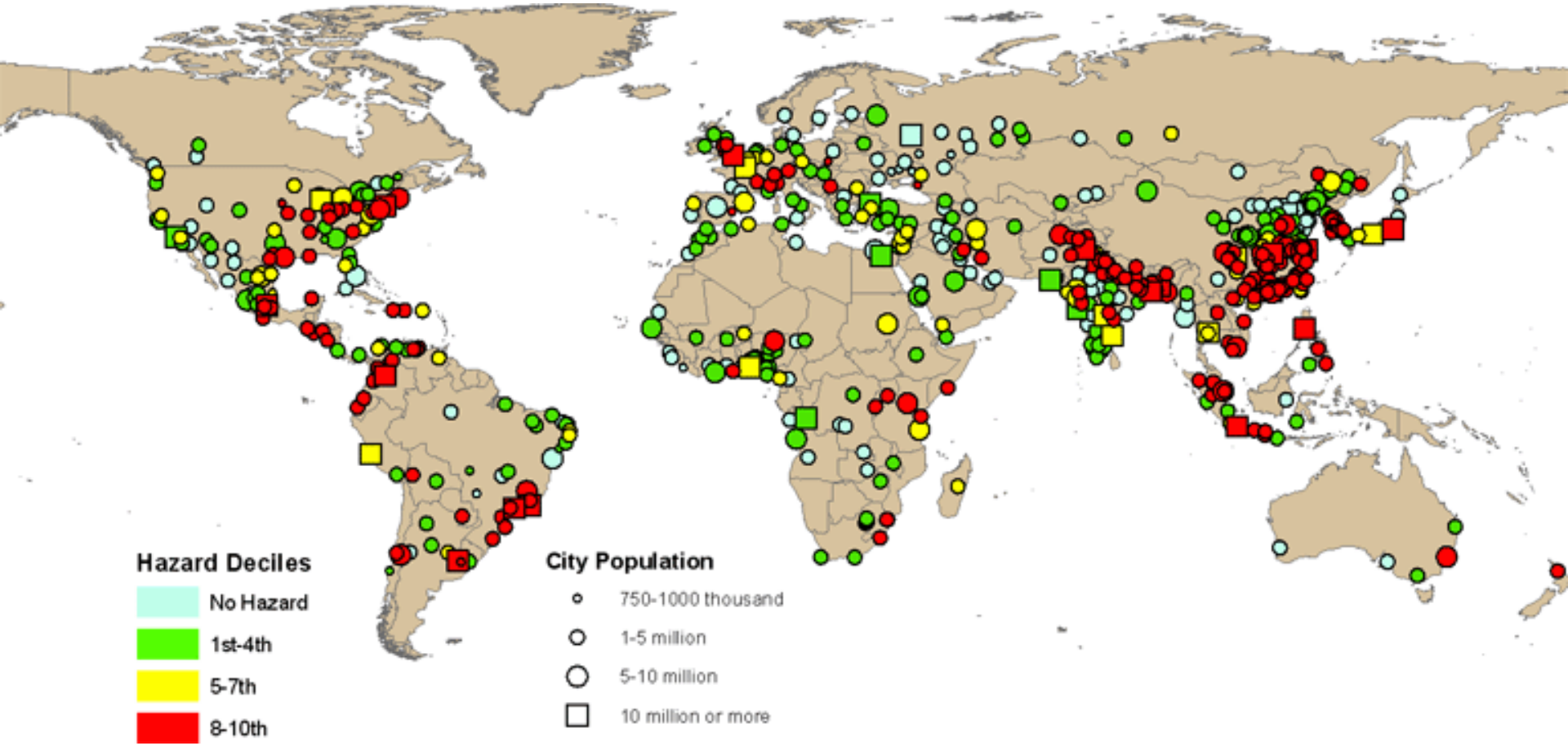
EXTREME HEAT

DROUGHT

URBAN FLOODING

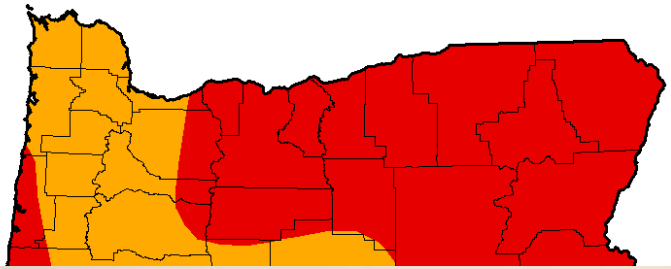
Urban Flooding as a Global Challenge

Projected flood risk for world cities 2025

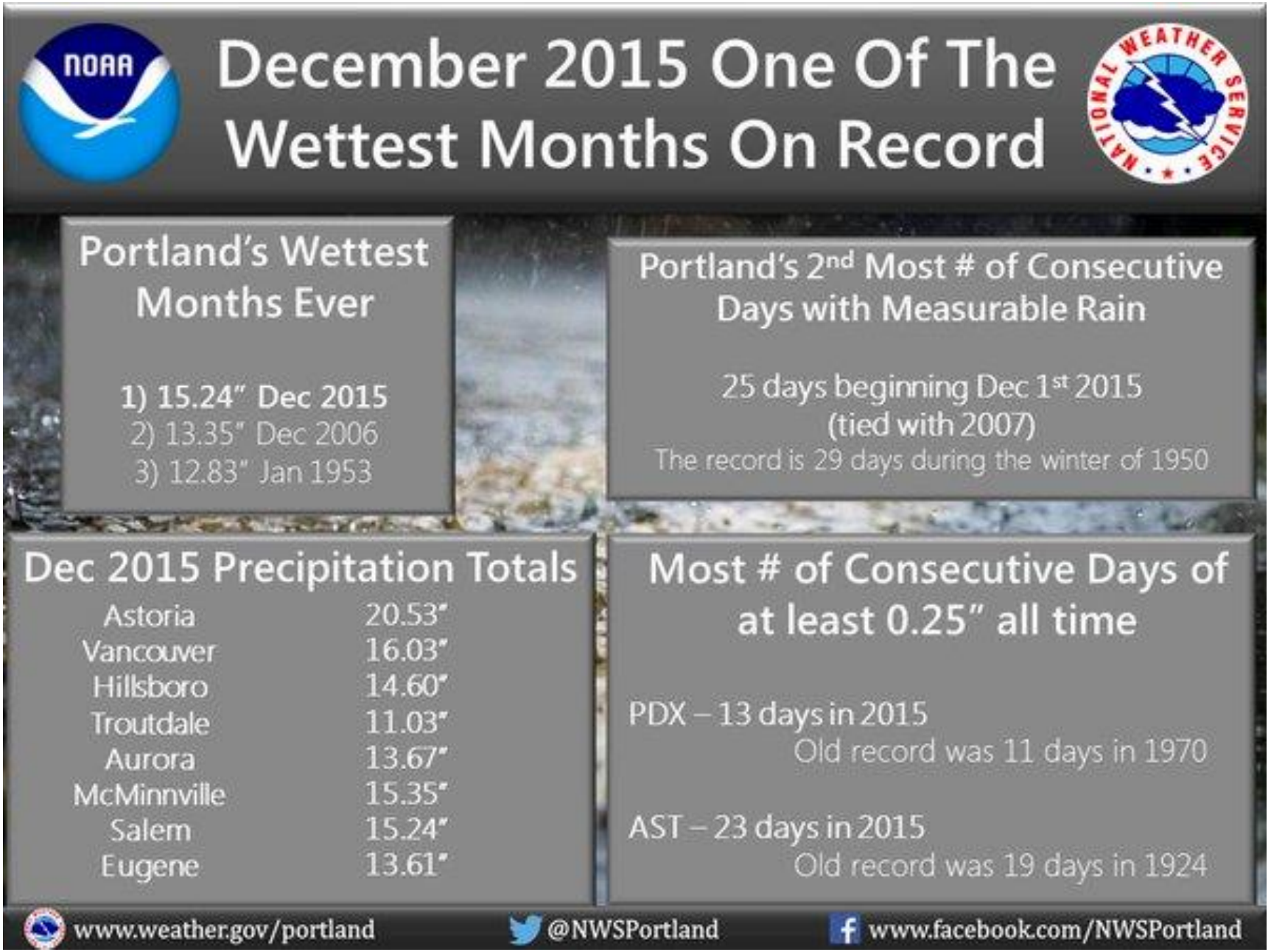


UN Population Division, 2011. World Urbanization Prospects, the 2011 revision


2015 To Go Down As The Warmest Meteorological Summer on Record
Portland
Salem
Eugene
Avg. Temp. (
2015 72
2009 69
2014 69
2004 69
1967 69
~75 years of
www.weather.gov/po




Smoke In Portland 08/22/2015
Courtesy: April Clayton


December 2015 One Of The Wettest Months On Record
Portland's Wettest Months Ever
1) 15.24" Dec 2015
2) 13.35" Dec 2006
3) 12.83" Jan 1953
Portland's 2nd Most # of Consecutive Days with Measurable Rain
25 days beginning Dec 1st 2015
(tied with 2007)
The record is 29 days during the winter of 1950
Dec 2015 Precipitation Totals
Astoria 20.53"
Vancouver 16.03"
Hillsboro 14.60"
Troutdale 11.03"
Aurora 13.67"
McMinnville 15.35"
Salem 15.24"
Eugene 13.61"
Most # of Consecutive Days of at least 0.25" all time
PDX – 13 days in 2015
Old record was 11 days in 1970
AST – 23 days in 2015
Old record was 19 days in 1924
www.weather.gov/portland
@NWSPortland
www.facebook.com/NWSPortland


Yes, A Wet Winter Indeed!
Meteorological Winter (1 Dec to 28/29 Feb)
Rainfall Rank Normal
Portland Airport 25.27" #1 14.14"
Downtown Portland 31.06" #3 17.39"
Vancouver 25.77" #2 15.60"
Hillsboro 24.74" #4 15.86"
McMinnville 26.34" #6 15.63"
Salem 24.86" #13 17.45"
Eugene 22.56" #25 20.39"
Astoria 40.06" #20 27.55"
Winter 2015-16 through 18 February. Rankings include full winter (1 Dec – 28/29 Feb). Period of record: 1890s to present, except Portland airport which is since 1940.

VISION A network of collaborating interdisciplinary scientists and practitioners from diverse world cities working together to promote, design, and implement urban infrastructure that is resilient in the face of future extreme events, provides ecosystem services, improves social well being, and exploits new technologies in ways that benefit all segments of urban populations.

Network

- North and Latin America
- 10 Cities

Baltimore, MD

Hermosillo, Mexico

Mexico City, Mexico

Miami, FL

New York, NY

Phoenix, AZ

Portland, OR

San Juan, Puerto Rico

Syracuse, NY

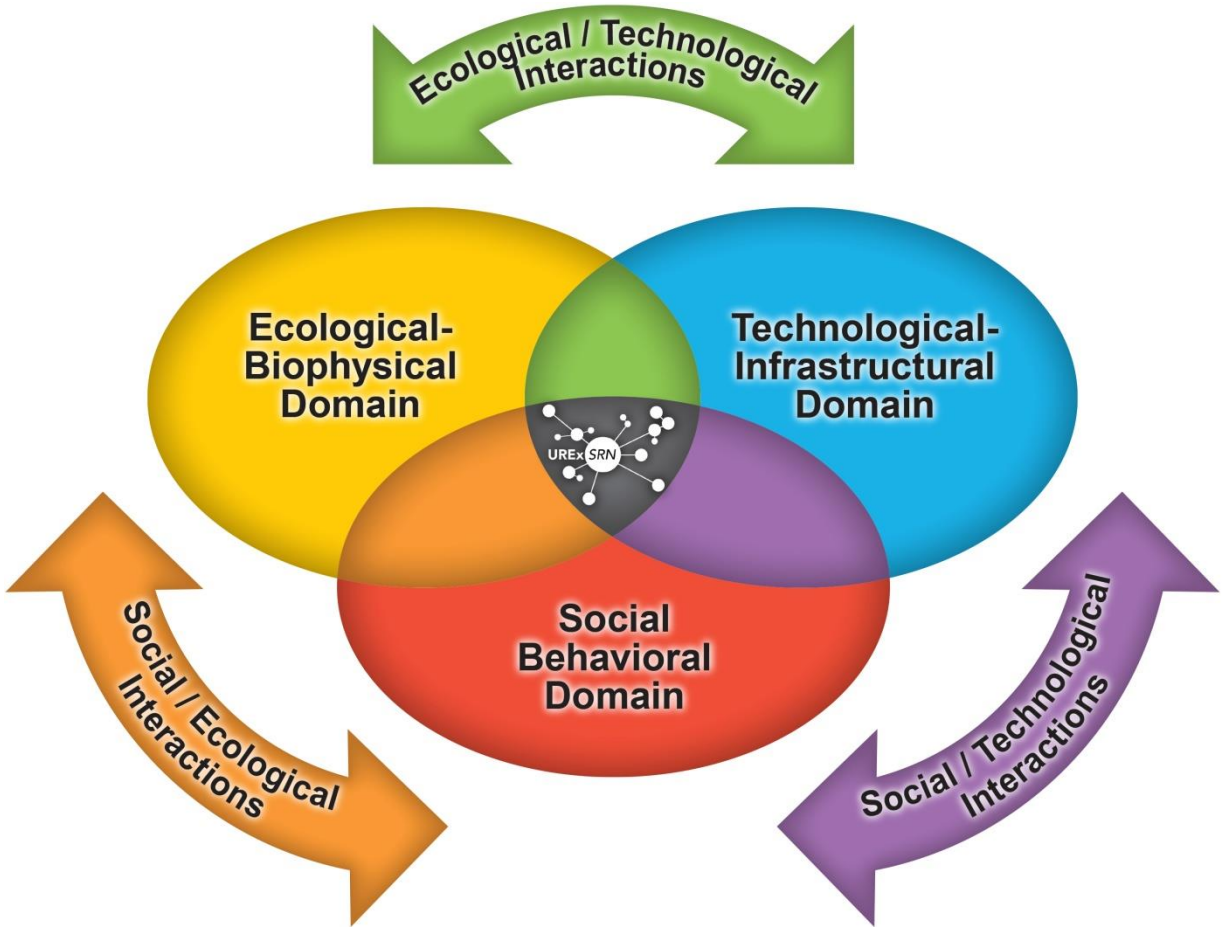
Valdivia, Chile

Syracuse
New School
Colorado
City U NY
NYU
Cary Inst.
U Maryland
Florida Int. U
Clark U
U Puerto Rico
Ohio State
Notre Dame
UCLA
USDA Forest Service
Portland State
Arizona State
Inst. Tec. Sonora
U Austral Chile

Network

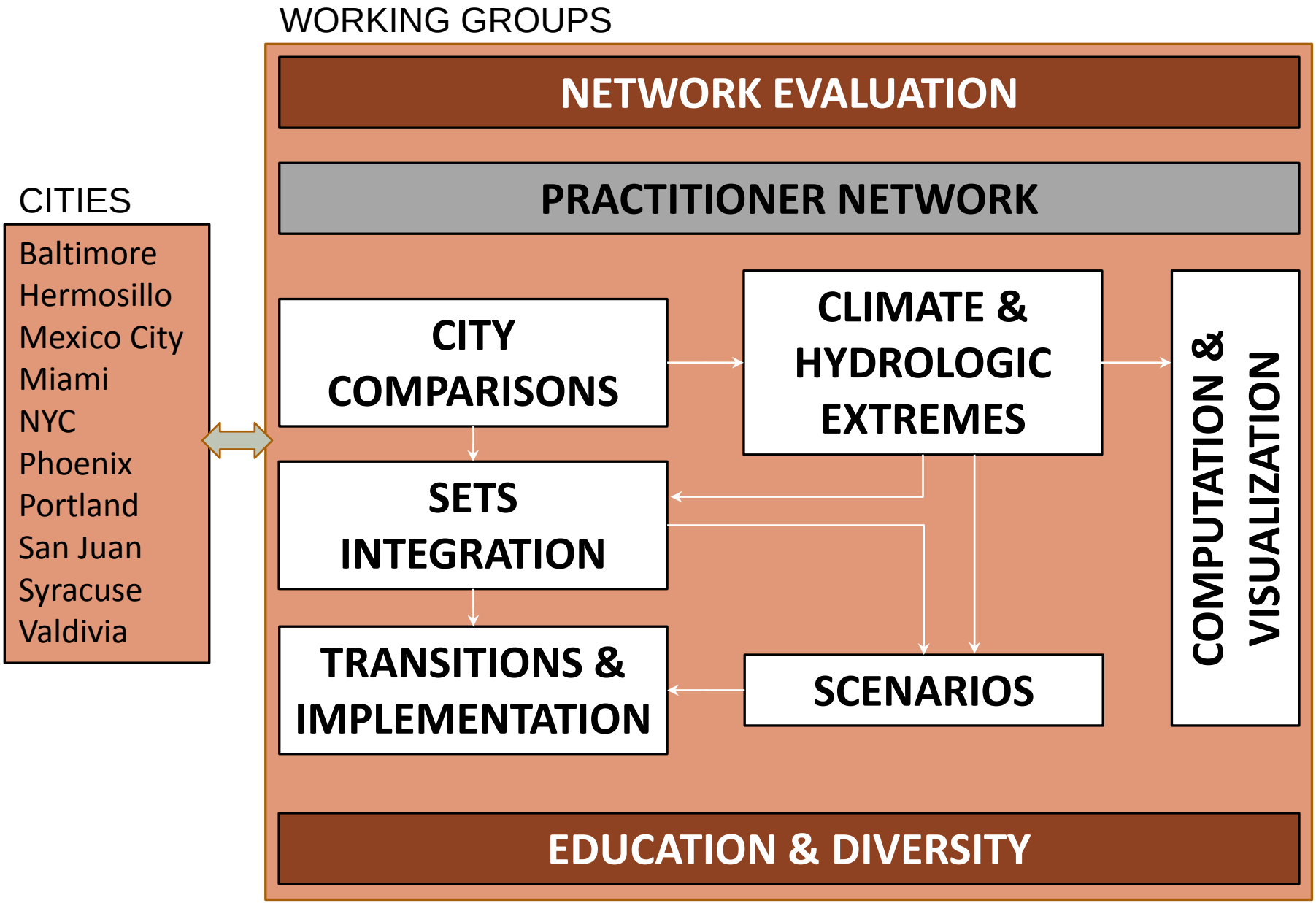
- North and Latin America
- 10 Cities
- 18 Partner Institutions
- 65 Researchers

Social-Ecological-Technical Systems Conceptual Framework

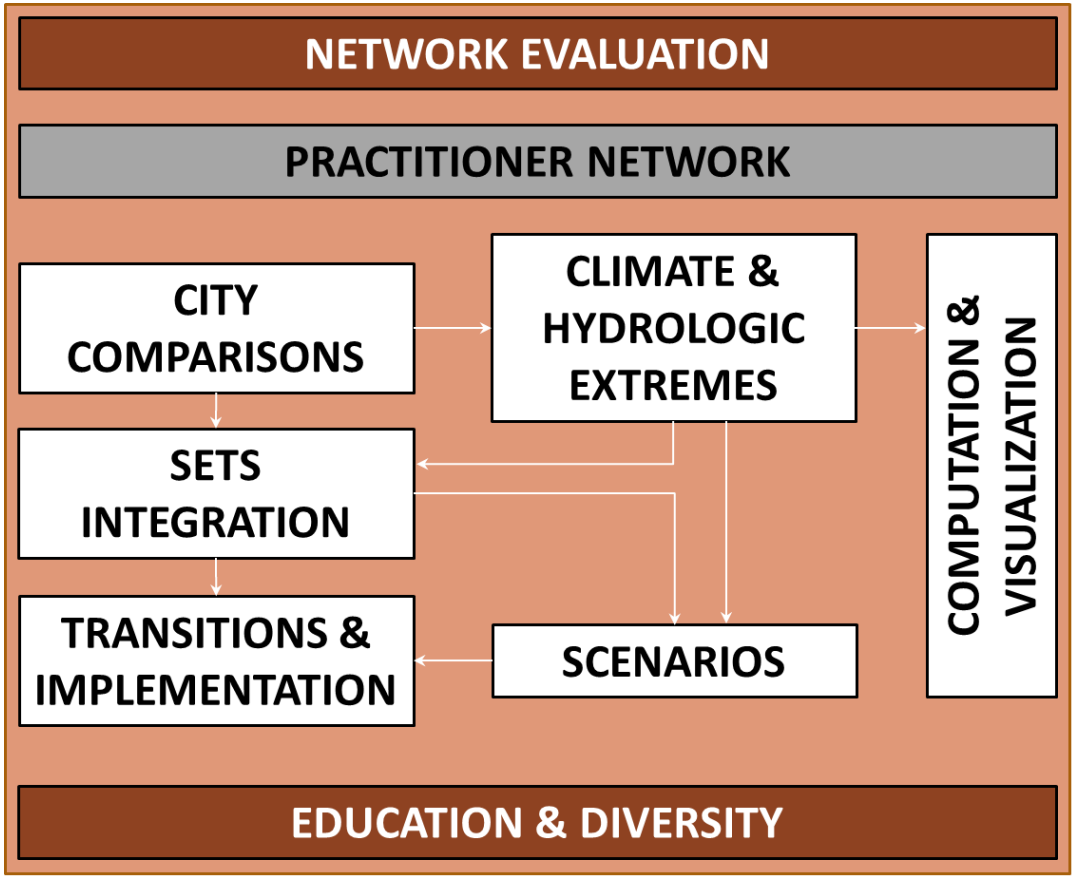


Overarching Conceptual Question

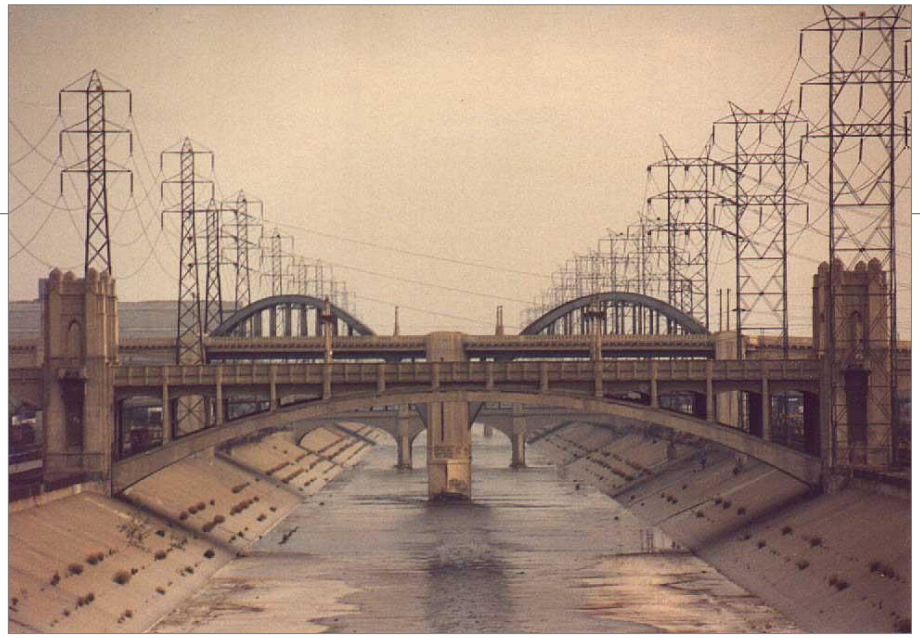
How do SETS domains interact to generate **vulnerability** or **resilience** to climate-related extreme events, and how can urban SETS dynamics be guided along more **resilient, equitable, and sustainable trajectories**?


WORKING GROUPS
NETWORK EVALUATION
PRACTITIONER NETWORK
CITIES
Baltimore
Hermosillo
Mexico City
Miami
NYC
Phoenix
Portland
San Juan
Syracuse
Valdivia
CITY COMPARISONS
CLIMATE & HYDROLOGIC EXTREMES
COMPUTATION & VISUALIZATION
SETS INTEGRATION
TRANSITIONS & IMPLEMENTATION
SCENARIOS
EDUCATION & DIVERSITY

Strategic Goals



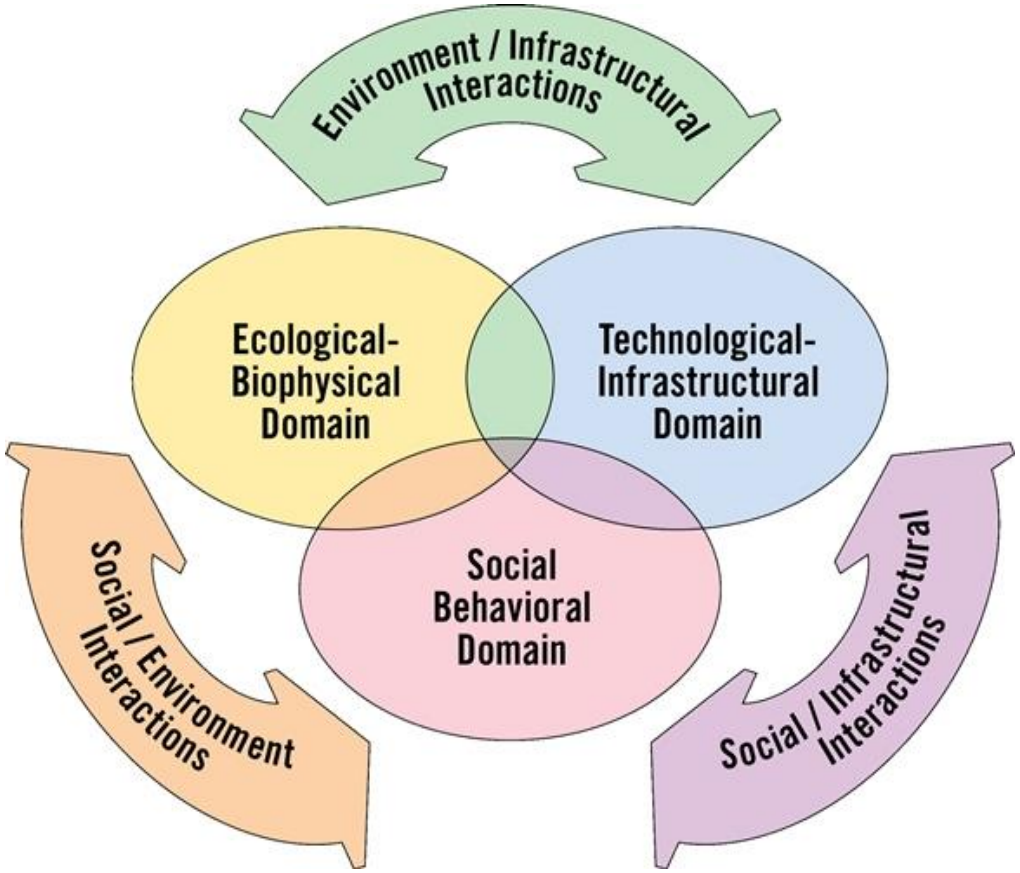
Build a network of cities, institutions, and student, post-doctoral, and faculty researchers to explore resilience of cities to the expected increase in frequency and intensity of weather-related extreme events;



Strategic Goals

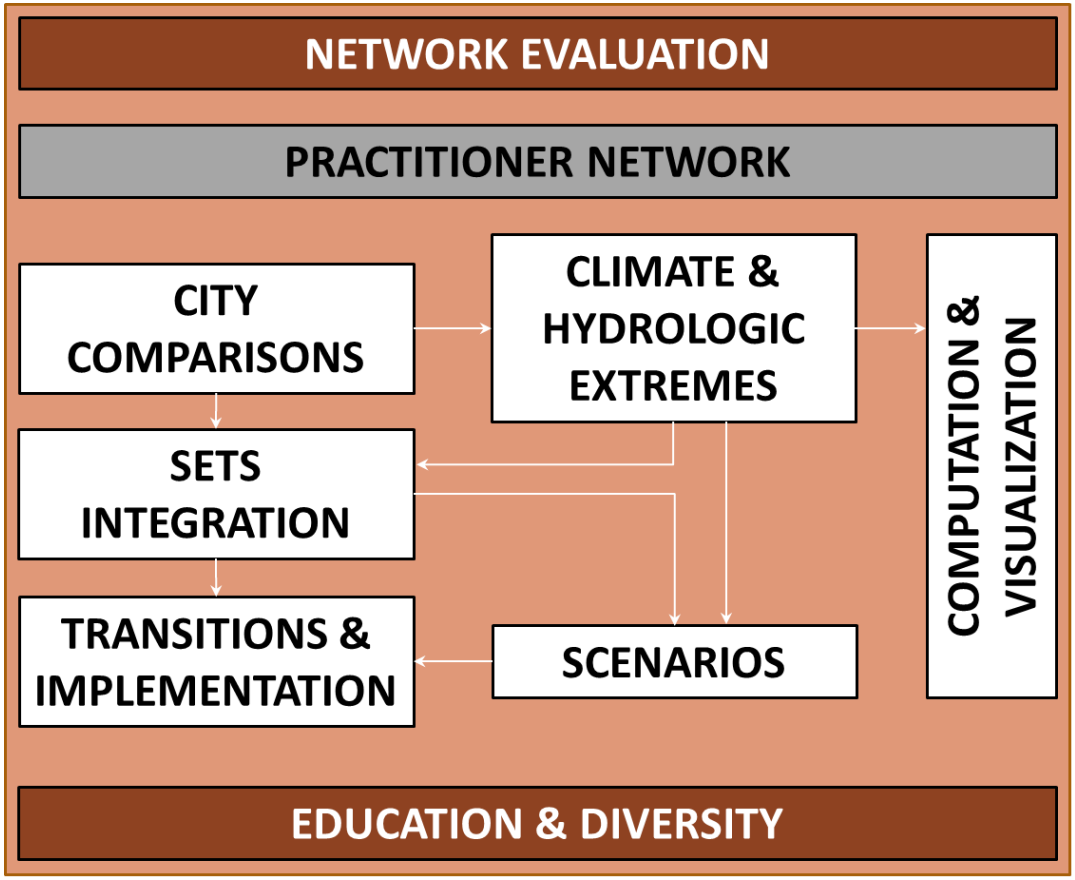
Develop novel theoretical frameworks that express a vision of sustainable, integrated urban infrastructure that is flexible, adaptable, safe-to-fail, socially equitable, and ecologically based;

Sociological-Ecological-Technological (SETS) Approach



Infrastructure must be resilient, provide ecosystem services, improve social well being, and exploit new technologies in ways that benefit all segments of urban populations and are appropriate to the particular urban context

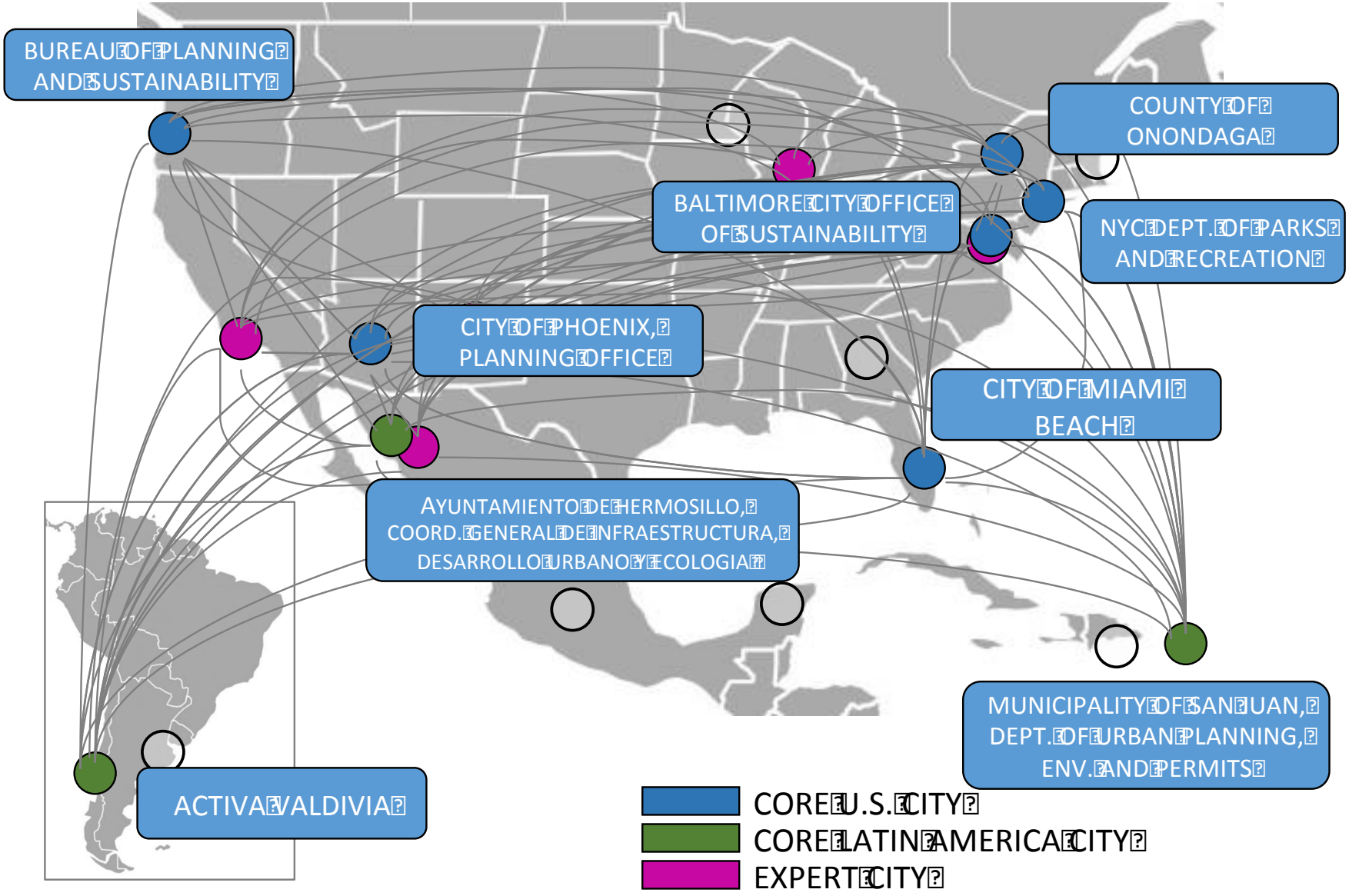
Strategic Goals



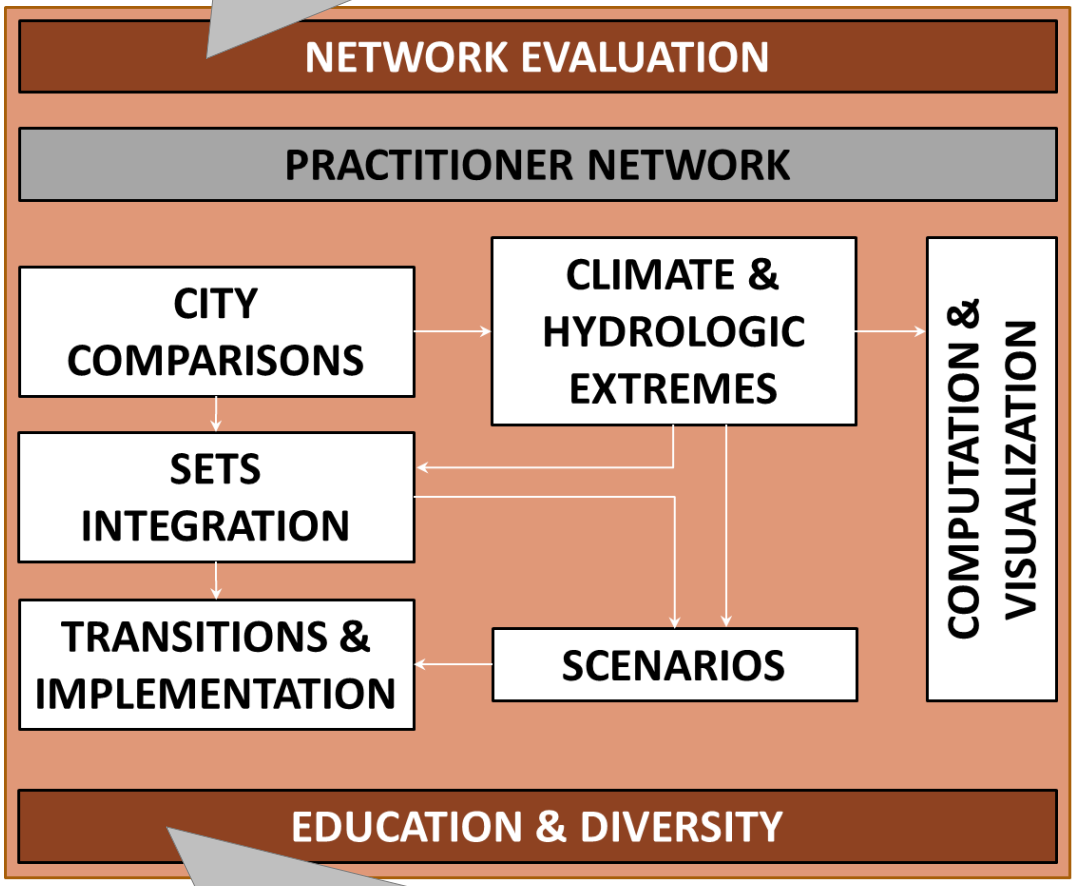
Work with practitioners and decision makers, as well as a cadre of graduate and post-doctoral fellows, to co-produce knowledge that facilitates data-driven visioning and ultimately transitions to a sustainable future for urban infrastructure and, by extension, the fabric of urban social-ecological-technological sustainability;

UREx Knowledge-Action Network

Practitioner Network Advisory Committee (PNAC)



a) monitoring and formative evaluation to promote organizational learning and inform adaptive management; (b) assessment of research practice, deliverables, and collaborations; and (c) analysis of the formation and evolution of the network.

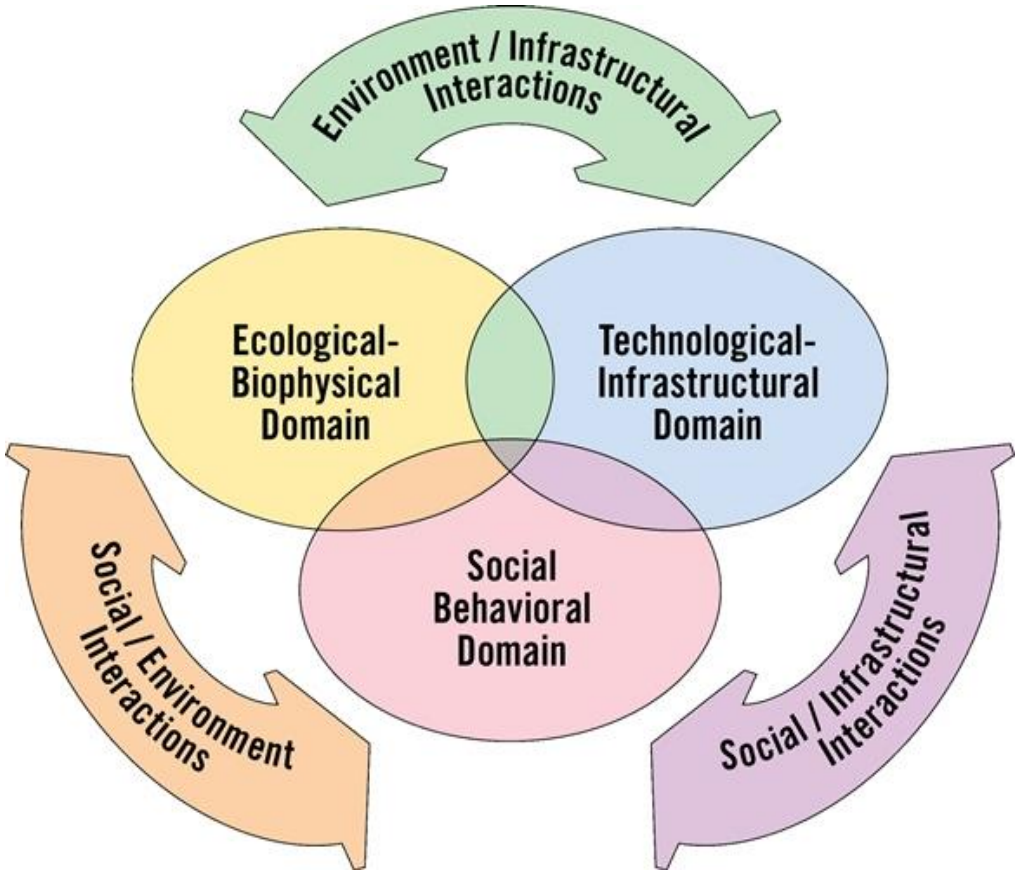


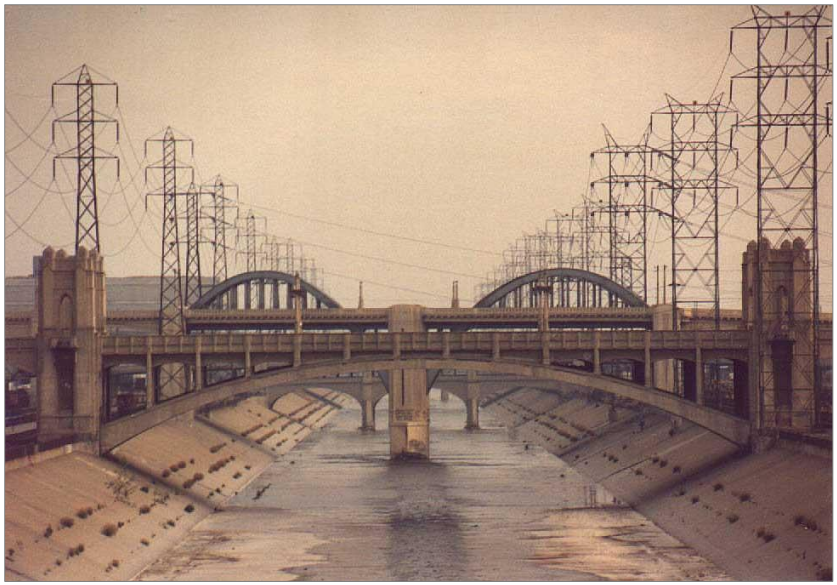
Reading group; Urban data, computation, and visualization summer school institute; design studio; early-career symposium; mentoring; science communication training.

Create a model for incorporating assessment, learning, and adjustment in response to evaluative feedback in a large, transdisciplinary, multi-institutional, multi-national research network.

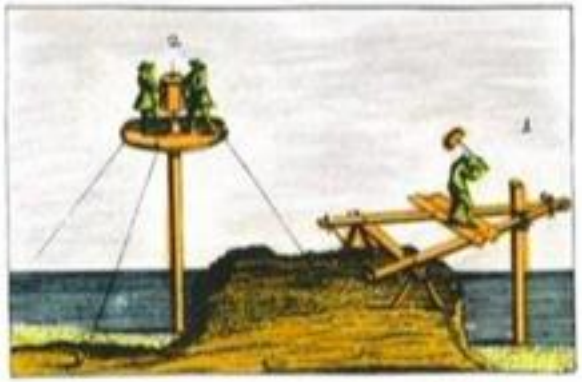
Some key themes

- SETs framework
- Safe-to-fail vs. Fail safe?
- Ecosystem service design
- Knowledge systems design


Environment / Infrastructural Interactions
Ecological-Biophysical Domain
Technological-Infrastructural Domain
Social Behavioral Domain
Social / Environment Interactions
Social / Infrastructural Interactions

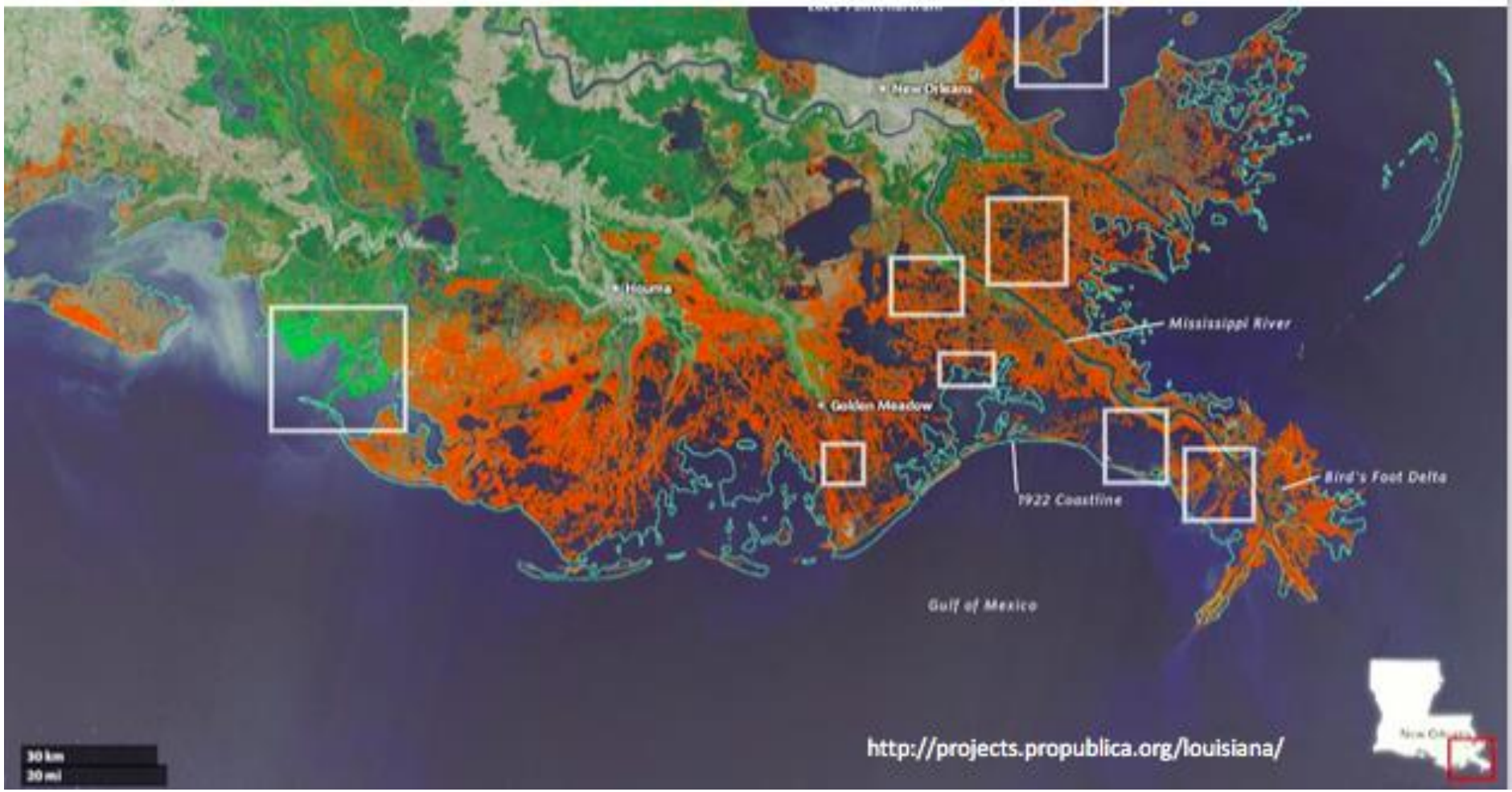


“For nature to take its course was simply unthinkable.”



Old River Control

"It's a mixture of hydrologic events and human events. It's planned chaos."



Traditional Solution

- "Fail safe" – low likelihood,
- High consequence of failure highly modified infrastructure

Resilient Solution?

- "Safe to fail" – more frequent failure, but minimal consequence
- Flexible
- Multifunctional

Allow some ecosystem function in hard-engineered structure

Develop new design that is a hybrid

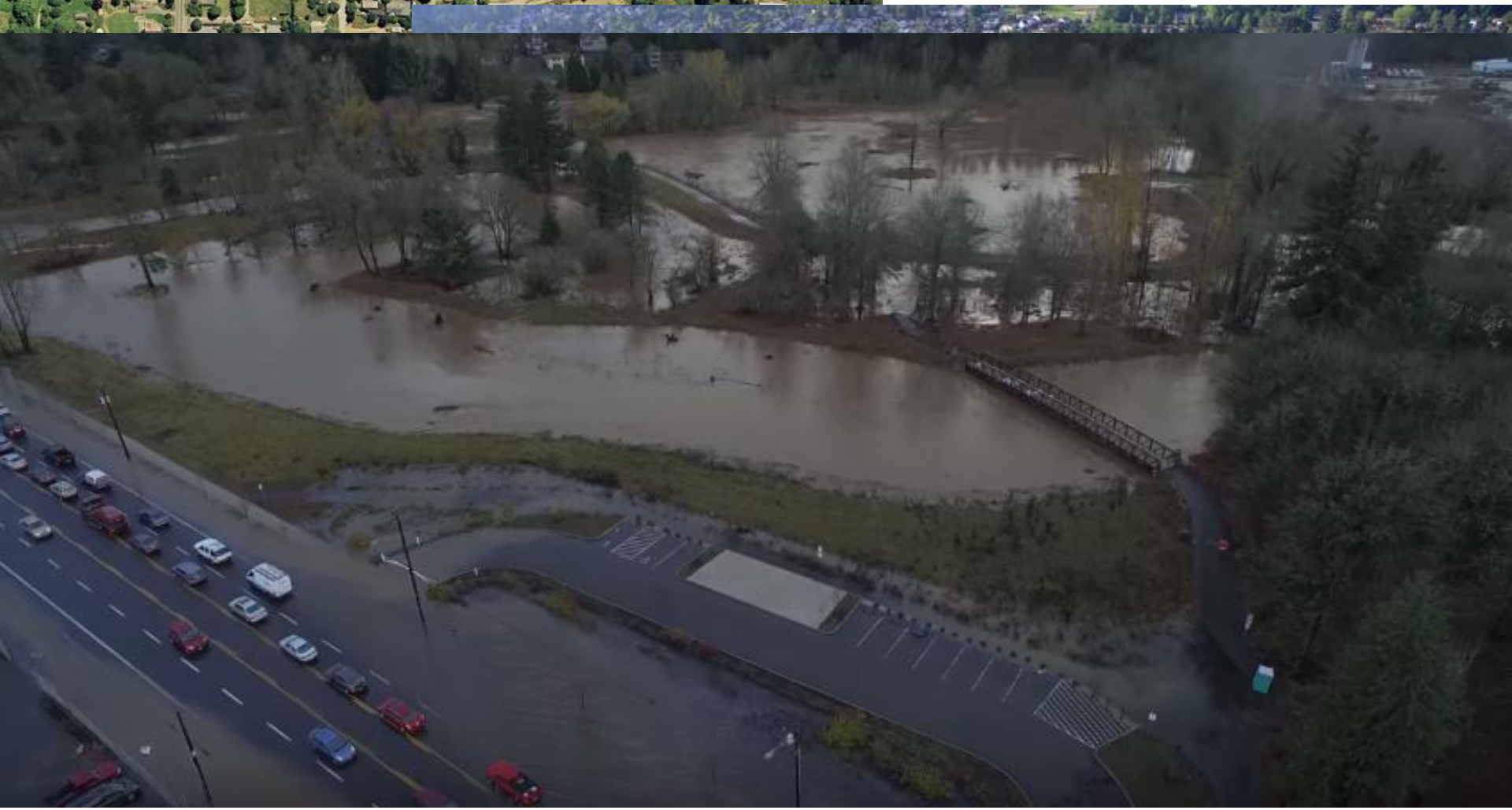
Optimize the conditions for ecosystem development

Strengthen the existing ecosystem

GRAY

BLENDED/HYBRID

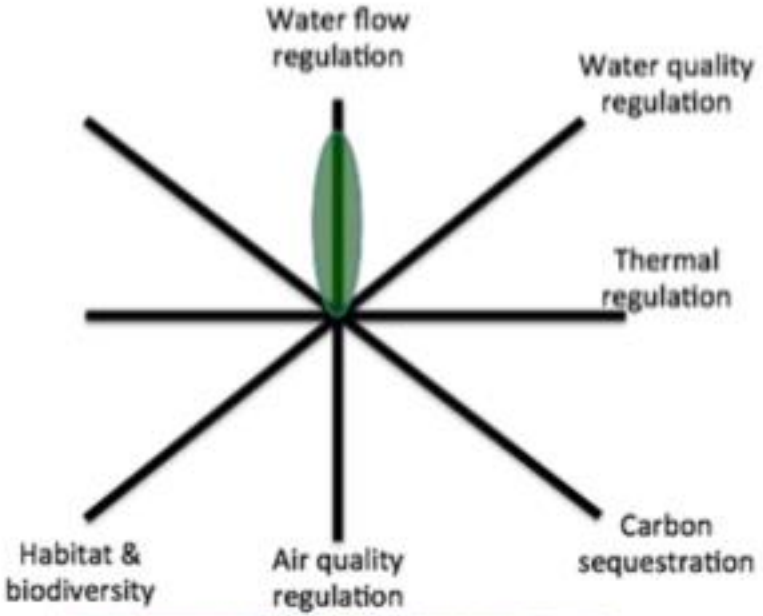
GREEN



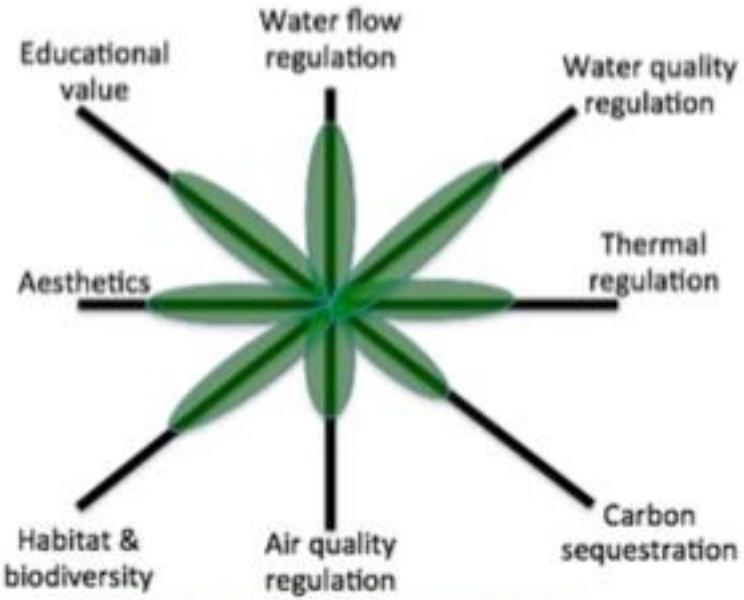
2013

Foster floodplain December 2015

Engineering and *institutional* design challenge.



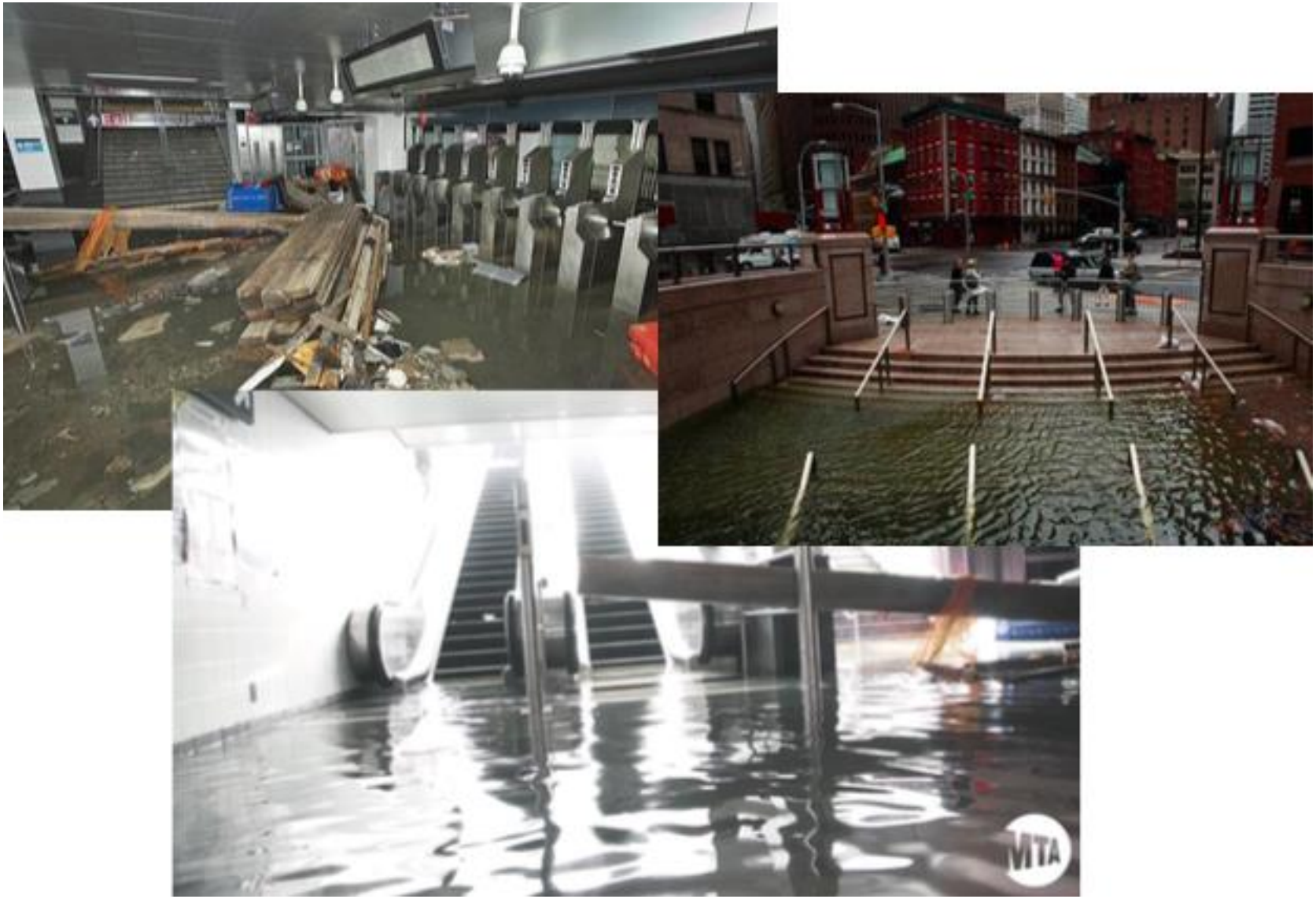
Grey Infrastructure

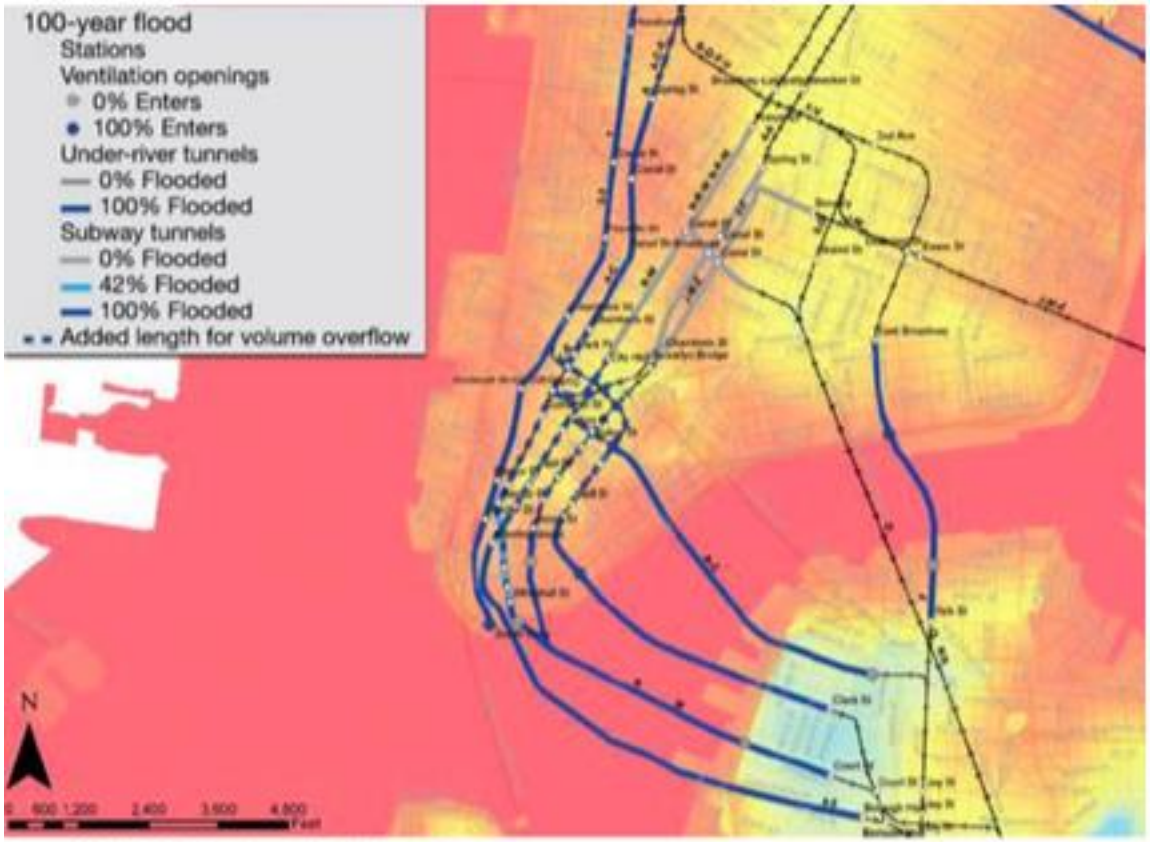


Green Infrastructure

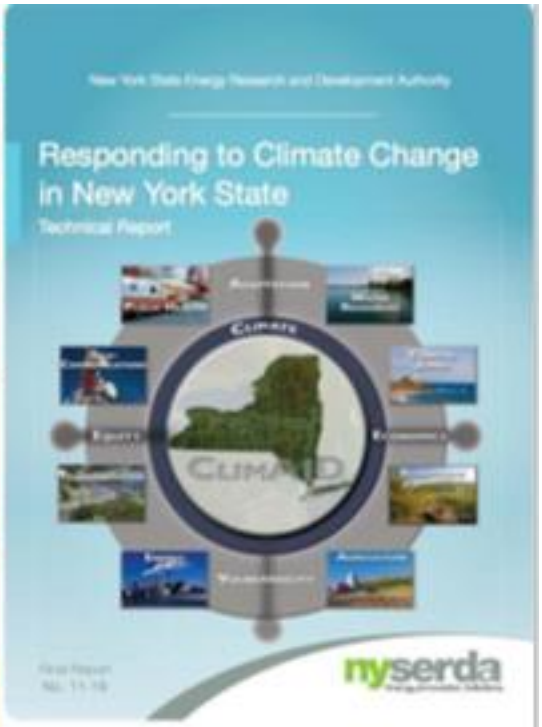
Not just the “hardware”…organizations that build, manage and maintain them; the data flows that control and sustain them; the background knowledge required to run and navigate them; and, the social norms that shape their acceptability, reliance and accessibility.

(Edwards 2003; Hommels 2005; Star 1999)


MTA

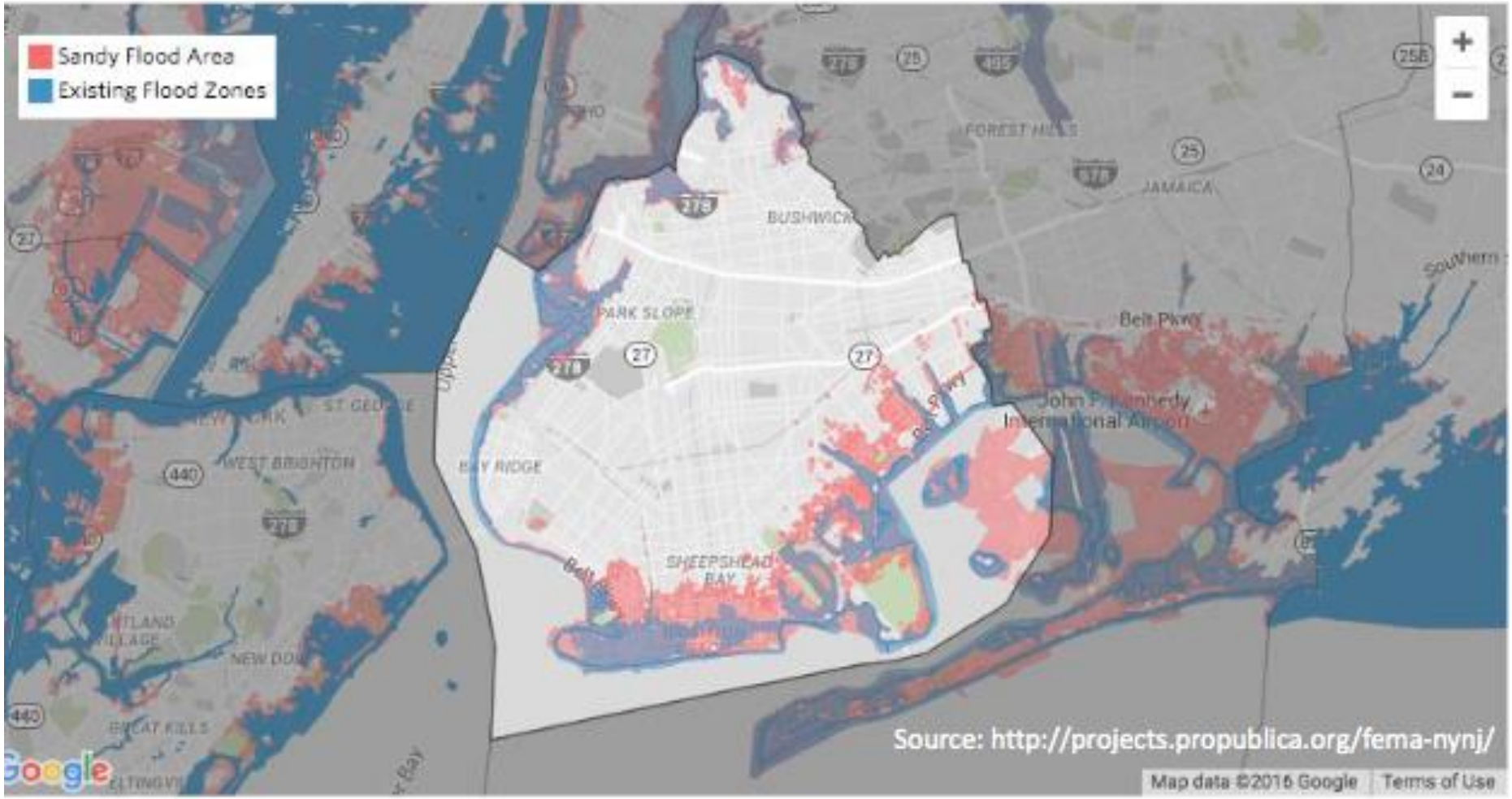


Source: LDEO/Civil Engineering, Columbia University



"Worse than worst case scenario."
-- MTA Chairman Joe Lhota

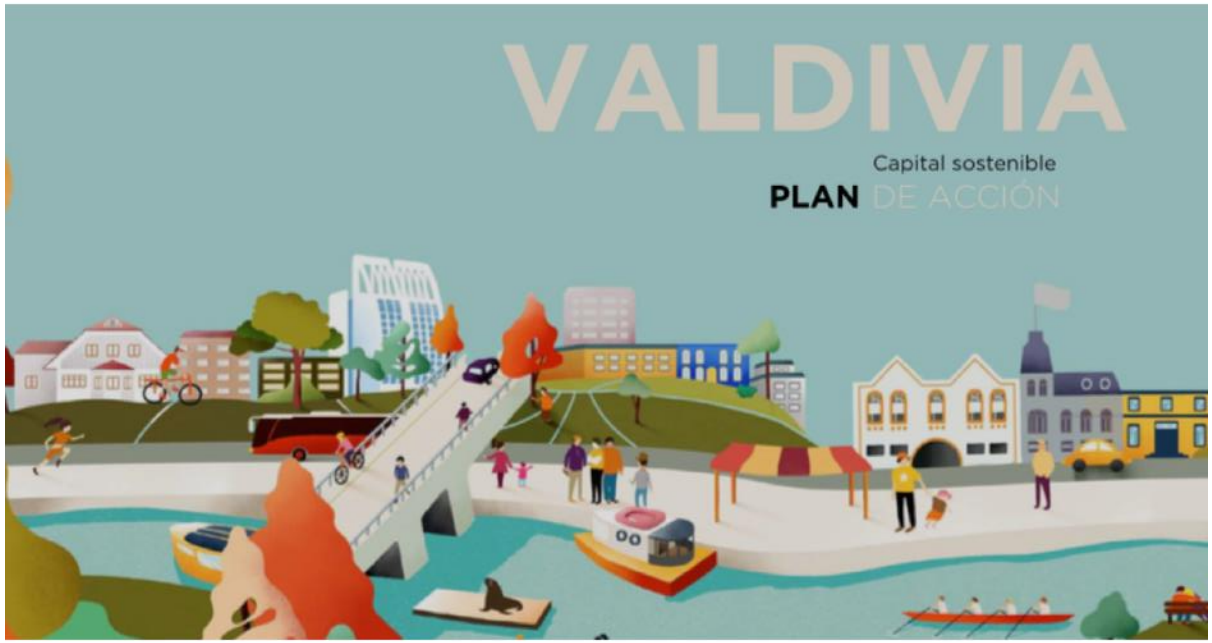
Best available scientific and technological knowledge often not used or widely disseminated (Colten et al. 2008)

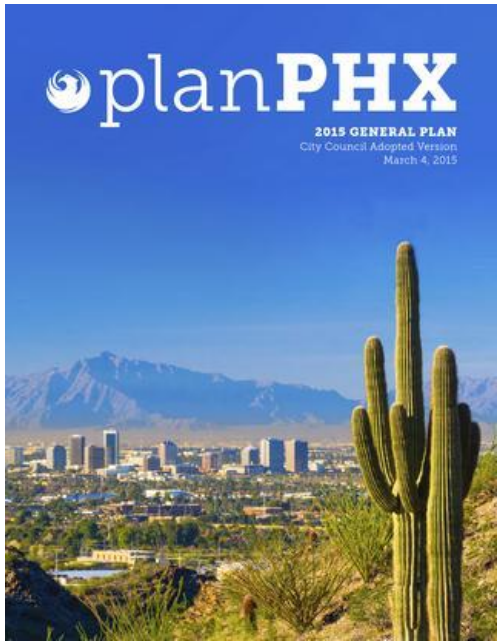


Knowledge Systems

- A knowledge system is a network of actors and institutions that generate, validate, share, and use knowledge claims in order to advance specific policies, decisions, and actions (Miller et al. 2010).

Linking Knowledge to Action

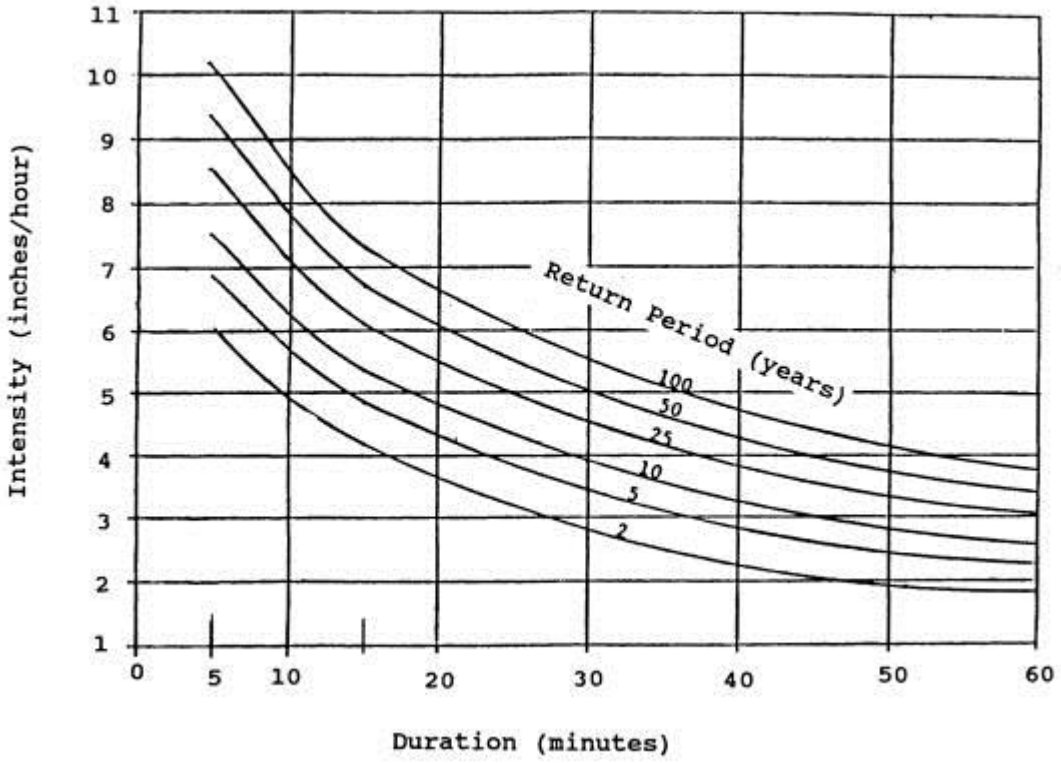




Support planning and decision making

ENVIRONMENTAL SERVICES
CITY OF PORTLAND

working for clean rivers




UREx
SRN